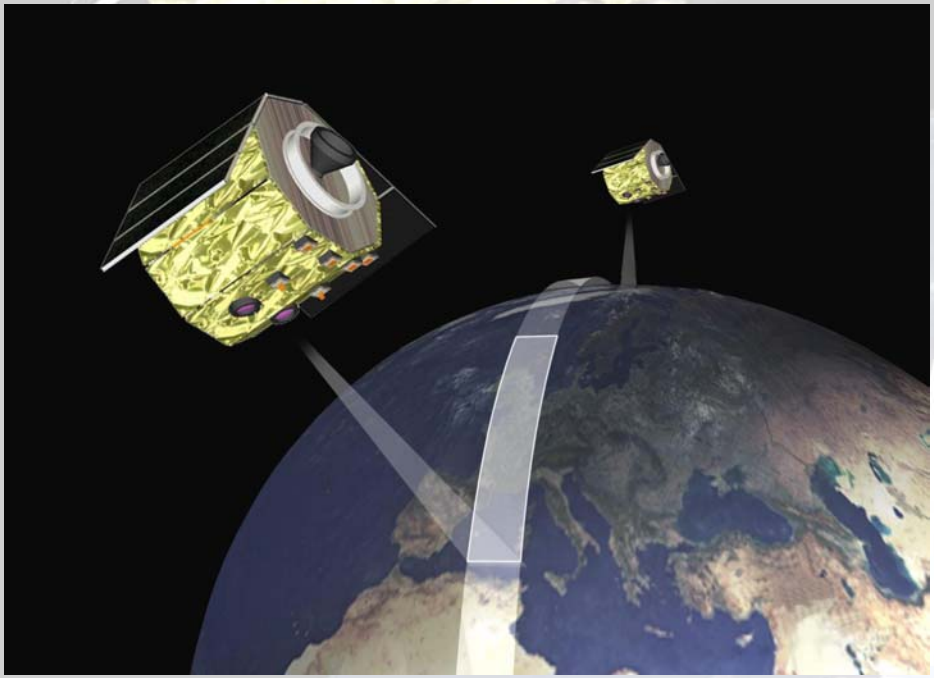
RAPIDEYE

The Global Geo Information Expert



International EESS Wideband Downlink Workshop

RapidEye Frequency Requirements

Orlando, 24-27 March 2003

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Mission Statement

We will **reliably** and **predictably** supply to our customers the **most current, cost-effective and high quality** information about features on the earth's surface – primarily **agricultural and cartographic** information. We will work in **partnership with our customers** to understand their business and tailor our services to meet their requirements.

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The Company

RapidEye

- founded in December 1998
- spin-off from Kayser Threde, a successful German engineering company
- project concept development initiated by KT in 1995 with the sponsorship from DLR (the German Space Agency)
- selected in 1998 as one of three lead projects for the commercialisation of the German space industry by DLR
- founders are the Vereinigte Hagelversicherung VVaG, the largest German agro-insurance company, the partners of Kayser-Threde, the management and some private investors

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The Concept

- **daily satellite revisit of any place on earth** allows system to take image on first cloud-free day
  - guaranteed and up-to-date data
  - multi-temporal analyses based on frequent data sets
- **highly automated ground processing** for rapid processing of large amounts of data
  - guaranteed delivery of products and services within 24 hours (best effort) to support clients' decision processes
  - reliable, error-free analyses
- **market-driven system configuration**
  - focus on specific customer groups (predominately agriculture)
  - detailed reports on specific types of crop, their health and vitality

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The System

- Turn-key system by a selected general contractor
  - MacDonald Dettwiler & Associates (MDA), Vancouver / Canada
- Baseline System Elements (MDA Responsibility):
  - constellation of five (5) micro satellites with an optical camera payload delivered in-orbit (lifetime: seven (7) years)
  - on-ground archiving and processing facilities established in Germany
  - satellite control station established in Germany
  - launch space segment (single launcher for all 5 satellites)
- Additional System Components (RapidEye Responsibility):
  - contracting global imagery data reception services
  - value added processing facilities established in Germany
- Begin Operations: Q1, 2006

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The Satellite

- Micro-satellite platform from Surrey Satellite Technology Ltd (SSTL), Guilford/England
- Payload consists of a multi-spectral imager and digital processing electronics
  - 6.5 m ground resolution, 80 km swath
  - 5 spectral bands (r,g,b,red-edge,near-infrared)
- Acquired image data will be compressed and stored onboard until downlink opportunity
- Across-track pointing of the S/C is used to achieve daily accessibility
  - max. spacecraft roll angle: ± 25 °
- Data downlink in X-band, TT&C in S-band (uplink and downlink)
  - can perform data downlink and TT&C operations at all spacecraft roll angles
- Spacecraft Antennas
  - X-band: crossed dipole antennas
  - S-band: mono-pole antennas for Tx, patch antennas for Rx

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The Orbit

- orbit altitude: 600 km
- inclination: 97.7° (sun-synchronous)
- period: 96.7 min.
- S/C phasing: all 5 S/C equi-spaced in the same orbit plane
- rev./day: 14.89
- flight path: descending
- equator crossing: 11:00 hrs ± 1 hrs

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The Data Downlink

- X-band frequency spectrum (8025 - 8400 Mhz)
- Data Reception facilities
  - no dedicated facilities are envisaged
  - plan to have long term service contracts with existing commercial data reception stations
- Preferred data reception stations
  - at high latitude
  - close to the RapidEye premises (vicinity of Berlin / Germany)
- Worldwide service area

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The Data Downlink (cont.)

- Key parameters:
  - centre frequency: flexible, can be anywhere in X-band spectrum
  - needed bandwidth: 75 - 155 MHz
  - modulation: QPSK
  - polarization: RHCP
  - EIRP: 14 dBW
  - max. iso. gain: 6.5 dBi
  - transmit power: 6 W
  - antenna coverage: iso-flux pattern (horizon-to-horizon)
    steerable (± 25° from nadir, across track)

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The TT&C Communication Links

- Main satellite control station located at RapidEye's premises in Germany
- TT&C Uplink (2025 - 2110 MHz):
  - Bandwidth: 15 kHz
  - Modulation: FSK
  - transmit power: 10 W
  - polarization: RHCP
  - Max. Iso. Gain: 7 dBi
  - receive antenna: near-omni coverage
- TT&C Downlink (2200 - 2290 Mhz):
  - Bandwidth: 62 kHz
  - Modulation: BPSK
  - transmit power: 0.25 W
  - polarization: LHCP
  - Max. Iso. Gain: 0 dBi
  - transmit antenna: near-omni coverage
- Service area: Germany (backup Europe)

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